LETTERS TO THE EDITOR.

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Colour of Water and Ice.

I HAVE read with much interest Sir Ray Lankester's letter on the colour of water in NATURE of March 17. I remember discussing this same problem in the case of ice with Sir Joseph Thomson when we stood at the foot of the great glacier at Glacier, B.C., during the western excursion of the British Association last summer. The rich blue colour of the hard, clear ice was remarkable, even in quite small pieces. The same blue colour is noticed when surface-ice, which has been formed slowly by conduction, is taken out of the St. Lawrence River. The blocks lose their colour when they are exposed for long to the light, and especially rapidly when exposed to sunlight. Coloured sediment and air cavities in the ice detract from the colour. I am inclined to believe that the colour of ice is a real absorption effect, due to the large molecular aggregates forming the structure, which absorb the long rays, and not a "blue sky" effect, as I suggested after seeing the blue ice of the glacier.

In the case of water, all the physical properties indicate the presence of complex molecular aggregates in solution, which become gradually reduced in number as the temperature rises. Thus the variation of specific heat, of density, of viscosity, and compressibility, all disclose an effect due to a gradual diminution of the molecular aggregates. I believe these are the same as the ice molecules, and constitute the absorbing medium which gives water its blue colour. Sea-water is particularly blue, and here we probably have added the effect of the salt molecules, in addition to the fact that the water is very clear.

Mr. W. H. Sherzer has shown (Smithsonian Report, 1907) that the blue colour of the water and ice of the glaciers of the Canadian Rockies is a real absorption effect. The blue colour is increased by the presence of minute white sediment, but not by coloured sediment.

If it has not been already tried, it would be very interesting to see what effect temperature has on the greenish-blue light transmitted through very pure water. If the colour is due to the presence of ice molecules, it should grow less as the numbers are reduced. I cannot help thinking of the beautiful blue colour of liquid air as soon as most of the nitrogen has boiled away; if this were due to the presence of complex oxygen molecules, such as ozone, it would be somewhat similar to water.

H. T. BARNES.

McGill University, Montreal, March 29.

Centre of Gravity of Annual Rainfall.

THE question whether Mr. Cook's suggestions in NATURE of March 31 have a practical value can be very simply settled. It is proposed to consider the month to month rainfalls at a place as a series of parallel forces, $p_1, p_2 \ldots p_{12}$, say, where the distance (X) from the beginning of the year of the corresponding "centre of gravity" is given by

$$X = \frac{p_1 + 2p_2 + \ldots + 12p_{12}}{p_1 + p_2 + \ldots + p_{12}}.$$

Now, if we assign arbitrary values to any ten, say, of the p's (and these ten p's could be selected in sixty-six ways), then, the position of the C.G. remaining the same, we have obviously a single linear equation in two variables to give us the values of the two remaining p's, and this equation can be solved in an infinite number of ways. Thus the same C.G. can be given by an infinitely varied arrangement of sizes of the p's, and therefore its position gives no indication whatever of the monthly distribution of the rainfall of the places referred to.

To illustrate by three simple examples. The absolute value of the elements is of no importance, and taking for convenience a rainfall of 36 inches, we might have the three following distributions:—

	A	B	C
	in.	in	in.
January	3	0	12
February	3	0	4
March	3	0	2
April	3	6	0
May	3	6	0
June	3	6	0
July	3	6	0
August	3	6	0
September	3	6	0
October	3	0	2
November	3	0	4
December	3	0	12
Total Rainfall	36	36	36
C.G.	6·5	6·5	6·5
Rainfall Moment	234	234	234

Thus A, B, and C have the same annual rainfalls, the same C.G., and the same "rainfall moment." The question whether or not the seasonal distributions correspond to those of actual places on the earth's surface is not to the point, though, as a matter of fact, C approximates to the typical Levantine curve.

Thus places with very different rainfall distributions may have the same C.G. and the same rainfall moment, and the proposed method of comparing the rainfalls of various places appears to have neither a theoretical nor a practical value. The method may possibly have a certain critical value in comparing the yearly variations at a particular place, where there is but little change in type from year to year, and especially in such a country as India, where the seasonal rainfalls are exceptionally well marked; but this seems doubtful, and in any case the method could be used only in conjunction with the actual monthly values.

ANDREW WATT.

Scottish Meteorological Society, Edinburgh, April 6.

Certain Reactions of Albino Hair.

UNDER this heading in NATURE of March 24 (p. 96) Miss Igerna Sollas referred to some experiments of mine upon the hair of albino rats, in which she failed to obtain one of the reactions described in my note (Proc. Physiological Soc., March 27, 1909). It is, of course, not improbable that different albino rats may carry different chromogens, and that some of them may lack the one which, when oxidised with H_2O_2, gives a brownish colour. On the other hand, the failure may be due to the presence of some of the formalin, which may not have been completely washed away from the previous reaction.

There is one new observation which I should like to record here, since it bears upon the H_2O_2 reaction. The action of H_2O_2 is an oxidising one, and the production of a brownish tint may be interpreted as due to the oxidation of a colourless chromogenous body present in albino hairs. If this interpretation is right, other oxidising agents should produce a similar tint. During November of last year I casually placed two dead albino rats upon the top of one of my cages, these latter being kept out of doors. The rats were forgotten, and left exposed to the air for about a fortnight. During this interval the weather had been wet and warm for the time of year. Upon discovering them at the end of this interval, I noticed that on both rats the upper side, and part of the belly and back, had assumed the same sort of brownish tinge that H_2O_2 produces. The under side of both rats, which had been protected from the wet and light by its contact with the cage, was quite white. It thus seems possible to oxidise the chromogenous substance ostensibly present in albino rats by the oxygen of the air in the presence of continuous moisture. I do not think that light played much part in the reaction, since throughout this period it was very dull weather.

The mention of light brings me to another point in Miss Sollas's note. She says that prolonged immersion in the

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formalin fluid results in the destruction of the colour. I am inclined to think that this destruction does not depend upon the solution, but is due to the action of light. I noticed the same thing in my experiments; but, in addition, I was enabled to observe—because I kept my rats in flat vessels standing on a *blackened* bench—that it was only the upper surfaces exposed to rather bright sunshine that thus faded. The under surfaces remained as brilliant a yellow as before. To confirm this conclusion I placed all my rats, still immersed in the solution, in a dark cupboard, and the partially faded colour somewhat returned, but not, I think, quite to the same intensity as originally. So long as I kept them in the dark the colour was retained. Whether this would be so indefinitely I should not like to say; but certainly it lasts for several months.

The yellow tinge assumed by some albino rats is, I think, not a phenomenon of light action, as Miss Durham, quoted by Miss Sollas, seems to imply, so much as one due to age. It is possibly a manifestation of diminished metabolism and lessened oxidation. Of the several hundred albino rats which I have bred, I do not remember any within their first year showing this yellow tinge, while it has been a frequent observation that old rats (after about the first year), though they were kept in semi-darkness, manifested a very obvious yellow colour. I do not wish to commit myself to this as a positive statement, for I made no scientific records of the matter. I am speaking from general impression alone; but it is certain there is a marked contrast between the pure white hairs of young rats, about six to eight weeks, and those of some twelvemonth or older rats, all living under the same conditions as regards light.

With regard to Miss Sollas's experiments with the skins of guinea-pigs and with that of a single mouse, there are several considerations of interest that suggest themselves. Miss Sollas found, as I did, that albino mice give a negative result with formalin; but I subsequently found (Proc. Physiological Soc., October 23, 1909) that if piebald mice are treated with 5 per cent. nitric acid in 75 per cent. *spirit* and are placed in the dark, in about five days most of the white areas of the pelage turn to a beautiful rose-pink colour. The same is true of albino mice. These experiments were performed in the summer; but during one cold week last winter I repeated the experiment on a single black piebald mouse, and the colour-reaction failed to appear. Upon placing the vessel containing the solution and mouse in an incubator at 102° F., the rose-pink colour appeared. The dependence of this colour-reaction upon temperature is confirmatory evidence that the phenomenon is one of ferment action.

It would be interesting to see if guinea-pig skins, which fail to respond to the formalin reagent, would do so with the nitric acid. Geo. P. Mudge.

Biological Department, London Hospital Medical College, E.

The Electrification of Insulating Materials.

Some time ago, while endeavouring to get a trustworthy method of producing static charges in a humid atmosphere, I had occasion to experiment with celluloid. Rolled celluloid sheet with the surface burnished was found very suitable. If a "tassel" be made of this material by cutting up a small piece of thin sheet into narrow strips, then by simply placing the "tassel" on a table and stroking with the fingers, strong electrification is produced. On raising the "tassel" the strips diverge, and remain divergent in a most striking manner.

A further curious effect was observed, that if two narrow strips of celluloid were rapidly pulled between the fingers they were both electrified, one of the surfaces in contact being positive, the other negative. At first no consistent results were obtained that might lead to an explanation of the phenomenon; some found the top strip always positive, some the bottom strip when the pieces were held horizontally. Later, however, Mr. M. McCallum Fairgrieve, of Edinburgh Academy, noticed that the order of electrification depended on whether the strips were bent upwards or downwards when pulled in a horizontal direction through the fingers. This seems to be the true explanation. Of the surfaces in contact, one is in compression, the other in tension; with celluloid the compressed surface is always negatively, the stretched surface positively, electrified. The effect is very apparent if the two strips are pulled slowly between the first finger and the thumb, and the strip in contact with the thumb will be + or − according as it is concave or convex to the thumb.

Of other substances investigated, paper, vulcanite, and shellac have the same property, and mica to a lesser degree.

I propose to investigate the phenomenon further, particularly with relation to electrification by compression and cleavage. In the meantime, I have made a small electrical machine in which three endless bands of celluloid run over pulleys. Suitable collectors are provided, and considerable + and − charges may be obtained. The charges are no doubt produced by the combined pressure and bending, as already explained.

Walter Jamieson.

Provanside Higher Grade School, Glasgow.

Effect of Varying Temperatures upon the Colour and Growth of Fur.

The following may be of interest to readers of Nature. Some time ago an ordinary all-black cat was accidentally shut up in a refrigerating chamber on one of the Orient Line mail steamers when the vessel was in Sydney Harbour. The chamber was not opened until the ship was off Aden, which is about thirty-two days out. When the cat was brought out it was scarcely recognisable. Its coat had become long and thick, and the fur on its back was nearly white. It had lost one ear through frost-bite.

The change in the cat's environment from the intense frost of a refrigerating chamber to the intense heat of the Red Sea was accompanied by a rapid change in the cat's appearance. The heavy white coat rapidly fell out, and by the time the ship reached London the cat had practically regained its normal appearance.

I did not see the cat, but have inquired carefully into the statements, and have had their truth vouched for by one of the directors of the Orient Company.

A. Campbell Geddes.

Royal College of Surgeons in Ireland, Dublin,
April 6.

April Meteor Showers.

In the present year there is likely to be a greater amount of meteoric activity about April 18–19 than, as might be expected, a few days later. There will then be an interval of quiescence until April 26. Between the latter date and the end of the month several important displays become due. The following are details of the most interesting showers, as calculated by the writer, that occur during the period April 12–30:—

Epoch April 19, 14h. 30m. (G.M.T.), shower of second order of magnitude. Principal maximum April 18, 22h. 18m.; secondary maxima on April 19 occur at 1h. 12m. and 9h. 25m.

Epoch April 27, 21h. 50m., shower of twenty-third order of magnitude. Principal maximum April 26, 16h. 26m. On April 26 there are also secondary maxima at 5h. 20m. and 18h. 55m., and another on April 27, 6h.

Epoch April 28, 11h. 15m., shower of fourteenth order of magnitude. Principal maximum April 30, 4h. 25m. There is a secondary maximum on April 28, 17h. 30m., and two others on April 29, at 12h. and 20h. 20m.

Epoch April 29, 12h., shower of fourth order of magnitude; the principal maximum becomes due about April 28, 12h.

While there are three meteor showers that fall between April 26 and the end of the month, there is only one of any importance during the period April 12–25. In some respects this earlier isolated display is the more interesting, however, owing to its being of greater intensity than the others, and of a somewhat different character.

Dublin. John R. Henry.

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